

## CLAIMS

What is claimed is:

1           1.       An apparatus comprising a plurality of switches each having a first input  
2       terminal, a second input terminal, a first output terminal and a second output terminal,  
3       each of the plurality of switches having a pass-through state in which data input to the  
4       first input terminal is passed to the first output terminal and data input to the second input  
5       terminal is passed to the second output terminal, and a cross-over state in which data  
6       input to the first input terminal is passed to the second output terminal and data input to  
7       the second input terminal is passed to the first output terminal, the plurality of switches  
8       interconnected to provide, at the output terminals of the plurality of switches,  
9       permutations of signals received via the input terminals of the plurality of switches.

1           2.       The apparatus of claim 1 wherein one or more of the plurality of switches  
2       has a broadcast state in which data input to the one of the first input terminal and the  
3       second input terminal is passed to the first output terminal and to the second output  
4       terminal.

1           3.       The apparatus of claim 1 wherein the plurality of switches comprises 352  
2       switches coupled as 32 by 11 array to provide a 64-bit Benes fabric.

1           4.       The apparatus of claim 1 wherein one or more of the plurality of switches  
2       comprises:

3 a first multiplexer coupled to the first input terminal an to the second input  
4 terminal to receive signals from the first input terminal and the second input terminal, the  
5 first multiplexer to pass signals from the first input terminal and the second input terminal  
6 to the first output terminal; and

7 a second multiplexer coupled to the first input terminal an to the second input  
8 terminal to receive signals from the first input terminal and the second input terminal, the  
9 second multiplexer to pass signals from the first input terminal and the second input  
10 terminal to the second output terminal.

1 5. The apparatus of claim 4 further comprising a control line to provide a  
2 control signal to the first multiplexer and to the second multiplexer such that when the  
3 control signal is in a first state the first multiplexer passes signals from the first input  
4 terminal to the first output terminal and the second multiplexer passes signals from the  
5 second input terminal to the second output terminal and when the control signal is in a  
6 second state the first multiplexer passes signals from the second input terminal to the first  
7 output terminal and the second multiplexer passes signals from the first input terminal to  
8 the second output terminal.

1 6. The apparatus of claim 1, wherein the plurality of switches are  
2 independently configurable.

1 7. The apparatus of claim 1 further comprising control circuitry coupled to  
2 the plurality of switches, the control circuitry to configure the plurality of switches.

1           8.     A method comprising:  
2           receiving a set of bits;  
3           passing the set of bits through multiple layers of switches, wherein each of the  
4     switches operates in a pass-through state in which data input to the first input terminal is  
5     passed to the first output terminal and data input to the second input terminal is passed to  
6     the second output terminal, or a cross-over state in which data input to the first input  
7     terminal is passed to the second output terminal and data input to the second input  
8     terminal is passed to the first output terminal, the switches interconnected to provide  
9     multiple permutations of signals input to the plurality of switches; and  
10          outputting a permuted version of the set of bits.

1           9.     The method of claim 8 wherein the switches comprise 352 switches  
2     coupled as 32 by 11 array to provide a 64-bit Benes fabric.

1           10.    The method of claim 8 further comprising providing a control signal to  
2     each of the switches, wherein the control signal causes the switches to be in either the  
3     pass-through state or the cross-over state.

1           11.    The method of claim 10 wherein the control signals are retrieved from a  
2     control register.